General

Guideline Title

KDOQI clinical practice guideline for hemodialysis adequacy: 2015 update.

Bibliographic Source(s)

National Kidney Foundation. KDOQI clinical practice guideline for hemodialysis adequacy: 2015 update. Am J Kidney Dis. 2015 Nov;66(5):884-930. [225 references] PubMed

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Kidney Foundation. Clinical practice guidelines for hemodialysis adequacy. Am J Kidney Dis. 2006 Jul;48(1 Suppl 1):S13-97. [364 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

Definitions for the quality of evidence (A-D) and the strength of recommendations (1,2) as well as additional considerations, are provided at the end of the "Major Recommendations" field.

Guideline 1: Timing of Hemodialysis Initiation

Patients who reach chronic kidney disease (CKD) stage 4 (glomerular filtration rate [GFR] <30 mL/min/1.73 m^2), including those who have imminent need for maintenance dialysis at the time of initial assessment, should receive education about kidney failure and options for its treatment, including kidney transplantation, peritoneal dialysis (PD), hemodialysis in the home or in-center, and conservative treatment. Patients' family members and caregivers also should be educated about treatment choices for kidney failure. (Not Graded)

The decision to initiate maintenance dialysis in patients who choose to do so should be based primarily upon an assessment of signs and/or symptoms associated with uremia, evidence of protein-energy wasting, and the ability to safely manage metabolic abnormalities and/or volume overload with medical therapy rather than on a specific level of kidney function in the absence of such signs and symptoms. (Not Graded)

Guideline 2: Frequent and Long Duration Hemodialysis

In-center Frequent Hemodialysis

The Work Group suggests that patients with end-stage kidney disease be offered in-center short frequent hemodialysis as an alternative to

conventional in-center thrice weekly hemodialysis after considering individual patient preferences, the potential quality of life and physiological benefits, and the risks of these therapies. (2C)

The Work Group recommends that patients considering in-center short frequent hemodialysis be informed about the risks of this therapy, including a possible increase in vascular access procedures (1B) and the potential for hypotension during dialysis. (1C)

Home Long Hemodialysis

Consider home long hemodialysis (6-8 hours, 3 to 6 nights per week) for patients with end-stage kidney disease who prefer this therapy for lifestyle considerations. (Not Graded)

The Work Group recommends that patients considering home long frequent hemodialysis be informed about the risks of this therapy, including possible increase in vascular access complications, potential for increased caregiver burden, and accelerated decline in residual kidney function. (1C)

Pregnancy

During pregnancy, women with end-stage kidney disease should receive long frequent hemodialysis either in-center or at home, depending on convenience. (Not Graded)

Guideline 3: Measurement of Dialysis: Urea Kinetics

The Work Group recommends a target single pool Kt/V (spKt/V) of 1.4 per hemodialysis session for patients treated thrice weekly, with a minimum delivered spKt/V of 1.2. (1B)

In patients with significant residual native kidney function (Kru), the dose of hemodialysis may be reduced provided Kru is measured periodically to avoid inadequate dialysis. (Not Graded)

For hemodialysis schedules other than thrice weekly, the Work Group suggests a target standard Kt/V of 2.3 volumes per week with a minimum delivered dose of 2.1 using a method of calculation that includes the contributions of ultrafiltration and residual kidney function. (Not Graded)

Guideline 4: Volume and Blood Pressure Control: Treatment Time and Ultrafiltration Rate

The Work Group recommends that patients with low residual kidney function (<2 mL/min) undergoing thrice weekly hemodialysis be prescribed a bare minimum of 3 hours per session. (1D) Consider additional hemodialysis sessions or longer hemodialysis treatment times for patients with large weight gains, high ultrafiltration rates, poorly controlled blood pressure, difficulty achieving dry weight, or poor metabolic control (such as hyperphosphatemia, metabolic acidosis, and/or hyperkalemia). (Not Graded)

The Work Group recommends both reducing dietary sodium intake as well as adequate sodium/water removal with hemodialysis to manage hypertension, hypervolemia, and left ventricular hypertrophy. (1B) Prescribe an ultrafiltration rate for each hemodialysis session that allows for an optimal balance among achieving euvolemia, adequate blood pressure control and solute clearance, while minimizing hemodynamic instability and intradialytic symptoms. (Not Graded)

Guideline 5: Hemodialysis Membranes

The Work Group recommends the use of biocompatible, either high or low flux hemodialysis membranes for intermittent hemodialysis. (1B)

Definitions

Grade for Quality of Evidence

A: High quality of evidence. The Work Group is confident that the true effect lies close to that of the estimate of the effect.

B: Moderate quality of evidence. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

C: Low quality of evidence. The true effect may be substantially different from the estimate of the effect.

D: Very low quality of evidence. The estimate of effect is very uncertain and often will be far from the truth.

Grade for Strength of Recommendation

	Implications		
Grade*	**Patients**	**Clinicians**	**Policy**
Level 1 (strong recommendation): "The Work Group Recommends"	Most people in your situation would want the recommended course of action and only a small proportion would not.	Most patients should receive the recommended course of action.	The recommendation can be adopted as policy in most situations.
Level 2 (conditional recommendation/suggestion): "The Work Group Suggests"	The majority of people in your situation would want the recommended course of action, but many would not.	Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with her or his values and preferences.	The recommendation is likely to require substantial debate and involvement of stakeholders before policy can be determined.

*The additional category "Not Graded" was used, typically to provide guidance based on common sense or where the topic does not allow adequate application of evidence. The most common examples include recommendations regarding monitoring intervals, counseling, and referral to other clinical specialists. The ungraded recommendations are generally written as simple declarative statements, but are not meant to be interpreted as being stronger recommendations than Level 1 or 2 recommendations.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Chronic kidney disease (CKD)

Guideline Category

Management

Treatment

Clinical Specialty

Family Practice

Internal Medicine

Nephrology

Intended Users

Advanced Practice Nurses

Health Care Providers

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To assist practitioners caring for patients in preparation for and during hemodialysis

Target Population

Patients with advanced chronic kidney disease (CKD) receiving hemodialysis

Interventions and Practices Considered

1. Patient education about kidney failure and options for its treatment
2. Initiation of dialysis based on signs and symptoms
3. Frequent and long duration hemodialysis
    - In-center frequent hemodialysis
    - Home long hemodialysis
    - Hemodialysis during pregnancy
4. Monitoring of hemodialysis dose (including formal urea kinetic modeling)
5. Assessment of hemodialysis adequacy (including blood urea nitrogen [BUN])
6. Control of fluid volume and blood pressure (treatment time and ultrafiltration rate)
7. New hemodialysis membranes (high or low flux)

Major Outcomes Considered

- All-cause mortality
- Cardiovascular mortality
- Myocardial infarction
- Stroke
- Hospitalizations
- Quality of life
- Depression or cognitive function scores
- Blood pressure
- Number of antihypertensive medications
- Left ventricular mass
- Interdialytic weight gain
- Harms or complications related to vascular access or the process of dialysis

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Searches of Unpublished Data

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic review and evidence synthesis were prepared by the Minnesota Evidence-

based Synthesis Program for use by the National Kidney Foundation (see the "Availability of Companion Documents" field).

Key questions were formulated by the evidence review team together with the guideline work group. This article focuses on the following key questions in the guideline update. (1) In patients with advanced chronic kidney disease (CKD), does initiating dialysis therapy earlier (as defined by higher glomerular filtration rate [GFR] at dialysis therapy initiation) improve outcomes? (2) In hemodialysis patients, does more frequent hemodialysis (>3 times a week) improve outcomes compared to less frequent hemodialysis? (3) In hemodialysis patients, does extended hemodialysis duration (>4.5-hour sessions) improve outcomes compared to usual-length hemodialysis duration? (4) Do patients with extended (longer) or more frequent hemodialysis have greater blood pressure and volume control compared with patients with shorter or less frequent dialysis? (5) In hemodialysis patients, do high-flux membranes improve patient outcomes when compared to low-flux hemodialysis? The evidence review team also addressed harms relevant to each question.

Search Strategy

The evidence review team developed a search strategy including terms for hemodialysis, CKD, and specific topics of interest for this review: initiation of hemodialysis therapy, hemodialysis frequency, duration of hemodialysis sessions, interdialytic weight gain, ultrafiltration rate, blood pressure and volume control, and membrane flux. They included search strings to identify randomized controlled trials (RCTs), controlled clinical trials (CCTs), and systematic reviews or meta-analyses. The evidence review team searched MEDLINE (Ovid) from 2000 to March 2014 for English-language studies in populations of all ages. They searched reference lists of recent systematic reviews and studies eligible for inclusion to identify studies not identified in the MEDLINE search. They searched ClinicalTrials.gov to identify recently completed studies and obtained input from members of the work group.

Study Selection

Abstracts identified by the literature search were triaged by an investigator or trained research associate. The evidence review team retrieved for full-text review any RCT, CCT, systematic review, or meta-analysis of hemodialysis for CKD related to the topics of interest. Two investigators or research associates reviewed the full text of articles identified from the abstract review or from other reference lists. Articles were potentially eligible if they involved long-term hemodialysis for CKD and provided outcomes of interest: all-cause mortality, cardiovascular mortality, myocardial infarction, stroke, all-cause hospitalization, quality of life, depression or cognitive function scores, systolic blood pressure, number of antihypertensive medications, left ventricular mass, interdialytic weight gain, dry weight, or harms or complications related to vascular access (e.g., access failure) or the process of dialysis (e.g., hospitalization due to fluid disorders). The evidence review team excluded crossover trials with hemodialysis session duration less than 28 days in each treatment arm.

For timing of dialysis therapy initiation (key question 1), they included RCTs in humans with advanced CKD that assigned individuals to different timing of dialysis therapy initiation (as defined by estimated kidney function at initiation) and reported outcomes of interest.

For frequency and duration of hemodialysis sessions (key questions 2-4), they included RCTs or CCTs in humans receiving long-term hemodialysis that assigned individuals to more frequent hemodialysis (>3 times a week) or longer duration (>4.5 hours) dialysis versus conventional hemodialysis and reported outcomes of interest.

For studies that compared low-flux with high-flux dialysis membranes (key question 5), they included RCTs or CCTs that enrolled at least 50 participants with chronic kidney failure in each treatment arm, with a minimum of 12 months' follow-up.

Number of Source Documents

The literature search for the full review yielded 3,701 abstracts (see Figure 1 in the systematic review [see the "Availability of Companion Documents" field]). During abstract triage, the evidence review team excluded 3,420 abstracts and identified 281 articles for full-text review. Because they performed individual searches for the different topic areas, there were 92 duplicate citations. Hand searching of systematic reviews, relevant publications, and the clinical trials registry yielded 20 articles. Of 209 unique articles, they excluded 167, as detailed in Figure 1. The full systematic review included 42 articles representing 28 trials; 32 articles from 19 trials were relevant for the key questions in this article. Study overview information is found in Tables S1 to S6 in the systematic review.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Grade for Quality of Evidence

A: High quality of evidence. The Work Group is confident that the true effect lies close to that of the estimate of the effect.

B: Moderate quality of evidence. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

C: Low quality of evidence. The true effect may be substantially different from the estimate of the effect.

D: Very low quality of evidence. The estimate of effect is very uncertain and often will be far from the truth.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic review and evidence synthesis were prepared by the Minnesota Evidence-based Synthesis Program for use by the National Kidney Foundation (see the "Availability of Companion Documents" field).

Data Extraction and Risk of Bias Assessment

The evidence review team extracted study and intervention characteristics; follow-up period and withdrawals; inclusion/exclusion criteria; patient characteristics; primary, secondary, and intermediate outcomes; and harms. Extraction was done by one research associate or investigator and verified by a second.

They assessed risk of bias of individual studies based on methods used by the Cochrane Collaboration. Studies were rated as low, moderate, or high risk of bias based on the following: sequence generation, allocation concealment, blinding, completeness of outcome data and use of intention-to-treat analysis, and selective outcome reporting and description of withdrawals. Controlled clinical trials (CCTs) were rated at least moderate risk of bias because allocation was not randomized.

Data Synthesis, Analysis, and Overall Quality Rating

Results were pooled if clinical heterogeneity of patient populations, interventions, and outcomes was minimal. Data were analyzed in Review Manager, version 5.2.5. Random-effects models were used to generate risk ratios (RRs) and 95% confidence intervals (CIs) for mortality outcomes. When available, hazard ratios (HRs) as reported in trials are presented in table footnotes. Statistical heterogeneity was summarized using the I2 statistic (50% indicates moderate heterogeneity, and >75% indicates substantial heterogeneity). Due to heterogeneity of study designs and interventions, we did not pool data for most outcomes. Other outcomes were summarized narratively. Quality of the overall body of evidence for a specific outcome was assessed using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach. The evidence review team added an additional level, "insufficient," indicating evidence was unavailable.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Structure of the Work Group

The volunteer members of the Work Group were selected for their clinical experience, as well as experience with clinical trials and familiarity with the literature, especially regarding the issues surrounding dialysis adequacy. All are practicing nephrologists who have many years of experience with care of patients dependent on kidney replacement therapy (KRT).

Guideline Statements

The Work Group distilled these answers in the form of 5 guidelines, some of which are similar to the previous guidelines published in 2006 but have been re-emphasized or reinterpreted in light of new data. For each of the guidelines, the quality of the evidence and the strength of the recommendations were graded separately using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach criteria: scales of A to D for quality of the evidence and 1 or 2 for strength of the recommendation, including its potential clinical impact. The guideline statements were based on a consensus within the Work Group that the strength of the evidence was sufficient to make definitive statements about appropriate clinical practice. When the strength of the evidence was not sufficient to make such statements, the Work Group offered recommendations based on the best available evidence and expert opinion. In cases in which controversy exists but data are sparse, the guideline is ungraded, based on consensus opinion of the Work Group. For a few of the guidelines, not all of the Work Group members agreed, and in such cases, the reasons for disagreement are spelled out in the rationale that follows the guideline statement. For all guidelines, clinicians should be aware that circumstances may appear that would require straying from the recommendations of the Work Group.

Rating Scheme for the Strength of the Recommendations

Grade for Strength of Recommendation

	Implications		
Grade*	**Patients**	**Clinicians**	**Policy**
Level 1 (strong recommendation): "The Work Group Recommends"	Most people in your situation would want the recommended course of action and only a small proportion would not.	Most patients should receive the recommended course of action.	The recommendation can be adopted as policy in most situations.
Level 2 (conditional recommendation/suggestion): "The Work Group Suggests"	The majority of people in your situation would want the recommended course of action, but many would not.	Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with her or his values and preferences.	The recommendation is likely to require substantial debate and involvement of stakeholders before policy can be determined.

*The additional category "Not Graded" was used, typically to provide guidance based on common sense or where the topic does not allow adequate application of evidence. The most common examples include recommendations regarding monitoring intervals, counseling, and referral to other clinical specialists. The ungraded recommendations are generally written as simple declarative statements, but are not meant to be interpreted as being stronger recommendations than Level 1 or 2 recommendations.

Cost Analysis

Published cost analyses were reviewed.

Method of Guideline Validation

External Peer Review

Description of Method of Guideline Validation

The Work Group appreciates the thoughtful review of the draft guideline and suggestions for improvement provided by over 60 voluntary external reviewers. Each comment was carefully considered and, when possible, suggestions for change were incorporated into the final report. As a result, this Update of the Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guideline for Hemodialysis Adequacy is the product of the Work Group, the Evidence Review Team (ERT), the National Kidney Foundation (NKF), and all those who contributed their effort to improve the updated guideline.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Longer hemodialysis sessions appear associated with better control of blood pressure (BP), possibly due to achieving better extracellular volume (ECV) control. Control of ECV with the combination of dietary sodium restriction and appropriate ultrafiltration with or without low-sodium dialysate has been shown to be effective for BP control and regression of left ventricular hypertrophy (LVH) in small uncontrolled studies of patients treated with conventional hemodialysis (4-5 hours). These findings remain unconfirmed in larger more contemporary clinical trials. Additional reported benefits of longer treatment times include lower serum phosphorus levels despite higher dietary phosphorus intake and reduced use of phosphate binders.
- A meta-analysis suggested that cardiovascular (CV) mortality was reduced in patients treated with high-flux membranes. Each of the 3 trials also showed statistically significant benefits of high-flux dialyzers on all-cause mortality for certain prespecified conditions (serum albumin ≤4 g/dL, undergoing maintenance HD for ≥3.7 years) or post hoc subgroups (patients with diabetes mellitus or arteriovenous [AV] fistulas).

Potential Harms

- Possible increase in vascular access complications, potential for increased caregiver burden, and possible accelerated decline in residual kidney function
- Women who conceive while undergoing conventional hemodialysis have very high rates of neonatal complications, including miscarriage, stillbirths, prematurity, and small-for-gestational-age births.
- More frequent or extended duration of dialysis sessions does not improve clinical outcomes compared to conventional dialysis (although the evidence is based on studies not powered to look at all-cause mortality or other clinical outcomes), but is associated with greater risk of vascular access–related procedures.

Qualifying Statements

Qualifying Statements

This Clinical Practice Guideline document is based upon the best information available as of June 2015. It is designed to provide information and assist decision making. It is not intended to define a standard of care, and should not be construed as one, nor should it be interpreted as prescribing an exclusive course of management. Variations in practice will inevitably and appropriately occur when clinicians take into account the needs of individual patients, available resources, and limitations unique to an institution or type of practice. Every health care professional making use of these recommendations is responsible for evaluating the appropriateness of applying them in the setting of any particular clinical situation. The recommendations for research contained within this document are general and do not imply a specific protocol.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy has not been provided.

Implementation Tools

Patient Resources

Slide Presentation

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

National Kidney Foundation. KDOQI clinical practice guideline for hemodialysis adequacy: 2015 update. Am J Kidney Dis. 2015 Nov;66(5):884-930. [225 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2015 Nov

Guideline Developer(s)

National Kidney Foundation - Disease Specific Society

Source(s) of Funding

National Kidney Foundation (NKF)

Guideline Committee

KDOQI Hemodialysis Adequacy Clinical Practice Guidelines Update Work Group

Composition of Group That Authored the Guideline

Work Group Members: John T. Daugirdas, MD (*Co-Chair*), University of Illinois College of Medicine, Chicago, IL; Thomas A. Depner, MD (*Co-Chair*), University of California, Davis, Sacramento, CA; Jula Inrig, MD, MHS, Duke University Medical Center, Yorba Linda, CA; Rajnish Mehrotra, MD, University of Washington, Division of Nephrology, Harborview Medical Center, Seattle, WA; Michael V. Rocco, MD, MSCE, Wake Forest School of Medicine, Winston Salem, NC; Rita S. Suri, MD, MSc, FRCPC, University of Montreal, Montreal, Quebec; Daniel E. Weiner, MD, MS, Tufts Medical Center, Boston, MA

Evidence Review Team (University of Minnesota Department of Medicine, Minneapolis VA Center for Chronic Disease Outcomes Research, Minneapolis, MN, USA): Nancy Greer, PhD, Health Science Specialist; Areef Ishani, MD, MS, Chief, Section of Nephrology, Associate Professor of Medicine; Roderick MacDonald, MS, Senior Research Assistant; Carin Olson, MD, MS, Medical Editor and Writer; Indulis Rutks, BS, Trials Search Coordinator and Research Assistant; Yelena Slinin, MD, MS, Assistant Professor of Medicine; Timothy J. Wilt, MD, MPH, Professor of Medicine and Project Director

Financial Disclosures/Conflicts of Interest

Kidney Disease Outcomes Quality Initiative (KDOQI) makes every effort to avoid any actual or reasonably perceived conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the Work Group. All members of the Work Group are required to complete, sign, and submit a disclosure and attestation form showing all such relationships that might be perceived or actual conflicts of interest. This document is updated annually and information is adjusted accordingly. All reported information is on file at the National Kidney Foundation (NKF).

Dr. Daugirdas reports no relevant financial relationships.

Dr. Depner reports no relevant financial relationships.

Dr. Inrig reports: Medical director salary from Quintiles and royalties from UpToDate.

Dr. Mehrotra reports no relevant financial relationships.

Dr. Rocco reports no relevant financial relationships.

Dr. Suri holds an unrestricted Extramural Research Grant from Baxter Inc.

Dr. Weiner reports: Research and medical director funding from DCI.

See *Biographic and Disclosure Information* in the original guideline document for additional information.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: National Kidney Foundation. Clinical practice guidelines for hemodialysis adequacy. Am J Kidney Dis. 2006 Jul;48(1 Suppl 1):S13-97. [364 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American Journal of Kidney Disease Web site .

Availability of Companion Documents

The following are available:

- Slinin Y, Greer N, Ishani A, MacDonald R, Olson C, Rutks I, Wilt TJ. Timing of dialysis initiation, duration and frequency of hemodialysis

sessions, and membrane flux: a systematic review for a KDOQI clinical practice guideline. Am J Kidney Dis. 2015 Nov;66(5):823-36. Available for purchase or to subscribers from the American Journal of Kidney Disease Web site.

- Slinin Y, Greer N, Ishani A, MacDonald R, Olson C, Rutks I, Wilt TJ. An evidence report for the kidney disease outcomes quality initiative clinical practice guidelines and recommendations for hemodialysis adequacy. Minneapolis (MN): Minnesota Evidence-based Synthesis Program; 2015. 115 p. Available from the American Journal of Kidney Disease Web site.
- Frequently asked questions (FAQ) HD 2015 update. New York (NY): National Kidney Foundation. 2015. 1 p. Available from the National Kidney Foundation (NKF) Web site.
- KDOQI hemodialysis adequacy. Clinical practice guideline update 2015: what you need to know. Slide presentation. New York (NY): National Kidney Foundation. 2016. 43 p. Available from the NKF Web site.

Patient Resources

The following is available:

- Hemodialysis. New York (NY): National Kidney Foundation. 2015. 3 p. Available from the National Kidney Foundation (NKF) Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

This NGC summary was completed by ECRI on September 1, 2001. The information was verified by the guideline developer as of November 19, 2001. This summary was updated by ECRI on December 18, 2006. This summary was updated by ECRI Institute on July 9, 2007, following the FDA advisory on erythropoiesis stimulating agents. This summary was updated by ECRI Institute on March 21, 2008 following the FDA advisory on Erythropoiesis Stimulating Agents. This summary was updated by ECRI Institute on August 15, 2008 following the U.S. Food and Drug Administration advisory on Erythropoiesis Stimulating Agents (ESAs). This summary was updated by ECRI Institute on April 1, 2010 following the U.S. Food and Drug Administration advisory on Erythropoiesis-Stimulating Agents (ESAs). This summary was updated by ECRI Institute on July 15, 2011 following the U.S. Food and Drug Administration advisory on erythropoiesis-stimulating agents (ESAs) in chronic kidney disease. This summary was updated again by ECRI Institute on April 20, 2016. The updated information was verified by the guideline developer on May 19, 2016.

Copyright Statement

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouseâ„¢ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria.